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Forest Pest Management
Pacific Northwest Region

FOREST PEST SURVEY
OF THE
ENOLA PLANNING AREA
ZIGZAG RANGER DISTRICT
MT. HOOD NATIONAL FOREST
OREGON

FOREST PEST SURVEY OF THE ENOLA PLANNING AREA, ZIGZAG RANGER DISTRICT, MT. HOOD NATIONAL FOREST, OREGON

Gregory M. Filip and Craig L. Schmitt

Plant Pathologists,
Forest Pest Management
Pacific Northwest Region
USDA Forest Service
Portland, OR 97208

SUMMARY

Approximately 500 acres of the Enola Planning Area were examined for pest-caused losses. Two separate sections of the Planning Area are visibly affected by laminated root rot at 19 and 27 percent of the total land area. Severe losses due to stem decay associated with fire scars were noted over most of the area surveyed. Management alternatives for pest-caused losses are discussed for this area with several highly critical resource concerns.

INTRODUCTION

On February 6 to 10, 1984, Forest Pest Management pathologists examined approximately 500 acres of the Enola Planning Area on the Zigzag Ranger District (Figure 1). The survey was made at the request of District silviculturists who suspected the occurrence of laminated root rot throughout most of the area. Enola is a sensitive area above the Zigzag River and Highway 26, a major thoroughfare between Portland and Mt. Hood. Visual quality, water quality, and proximity to a wilderness area are critical concerns affecting management options. The District particularly is concerned with windthrow that may occur as a result of timber harvesting in areas with laminated root rot.

Laminated root rot, caused by the fungus *Phellinus weirii*, is the most devastating pest of Pacific Northwest Douglas-fir. Highly susceptible hosts such as Douglas-fir (*Pseudotsuga menziesii*) experience growth loss, butt rot, and mortality as a result of infection. Tree-to-tree spread occurs across root contacts and grafts. The pathogen can remain viable and presumably infective in large stumps of killed or harvested trees for as long as 50 years. Douglas-fir that regenerates in root-diseased areas usually becomes infected within 15 years.

The Enola Planning Area is bordered on the north by private land and the Mt. Hood Wilderness Area. The southern boundary is the summer home tract along Highway 26. Stands in the area are composed primarily of old-growth Douglas-fir with western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) in drainages or on favorable aspects. Most of the area has a steep slope (30 to 50 percent) with a southwest aspect. The area was burned in 1951. Severely burned areas have regenerated to fir and alder. In areas of lighter burn, where trees were not killed, large trunk wounds are evident as a result of scorched and killed cambium.

METHODS

The Enola Planning Area consists of two separate sections designated A and B. A line-intercept survey method was used to locate areas affected by laminated root rot and to estimate percentage of area affected. Transects were established at 5-chain intervals across each section. Transect lengths and relative position of root disease centers were measured, using a model M-25 hip chain. Size of disease centers was determined by noting the beginning and ending intercepts of a disease center along the transect. Center intercepts were based on symptomatic trees. From the proportion of total transect length falling within affected areas, an estimate of the percentage of area with visible infection was made. Maps were constructed from the collected data showing approximate locations of disease centers. Due to the general lack of ground cover and lower tree limbs, all areas between transects could be viewed while walking along transects. Hence, there was essentially a 100 percent survey.

Suspected root disease centers were surveyed for the presence of root pathogens by examining roots of windthrown trees for laminated decay with setal hyphae diagnostic of *P. weirii*, or yellow, stringy decay caused by *Armillaria mellea*. In standing trees with advanced crown symptoms, soil was removed from root collars and at least two major roots. Bark surface was examined for ectotrophic mycelia of *P. weirii*, the barkwood interface examined for mycelial fans of *A. mellea*, and the sapwood examined for black stain caused by *Ceratocystis wageneri*. These are the major root diseases that cause mortality in the Douglas-fir type.

RESULTS

The Enola Planning Area was surveyed by a two-person crew in 5 days with over 14,200 yards of transects established across Sections A and B. The most serious pest affecting productivity of the site is laminated root rot. Percentage of total area that is visibly infected is 18.7 for Section A and 26.6 for Section B (Figures 2 and 3). According to Wallis and Bloomberg (1981), the actual area infected is probably twice the visibly infected area, as is the case in 45- to 60-year-old Douglas-fir stands on Vancouver Island, B.C.

Diseased areas in the Enola Planning Area were scattered throughout both Sections A and B and were quite variable in size and vegetative composition. Small centers 1 to 3 chains in diameter generally contained several dead or highly symptomatic Douglas-firs with bigleaf maple (*Acer macrophyllum*) or vine maple (*A. circinatium*) remaining or regenerating in the openings. Large disease centers 5 to 15 chains in diameter were characterized in two ways. Some centers were distinct openings created as a result of windthrow of all infected Douglas-fir. Openings were well stocked with sapling to pole-size red alder (*Alnus rubra*) and Douglas-fir. Other large centers consisted almost entirely of second-growth western hemlock with some dead and dying Douglas-fir. Most of the Douglas-fir was windthrown and infected with *P. weirii*. Hemlock is intermediately susceptible to laminated root rot (Hadfield and Johnson 1977). The species usually becomes infected when growing in association with diseased Douglas-fir. However, even though roots become infected and decay, hemlock is not commonly killed by *P. weirii*.

Other root diseases observed in the survey area were Armillaria root rot caused by *Armillaria mellea* and black stain root disease caused by *Ceratocystis wageneri*. Armillaria root rot was seen only on scattered suppressed hemlock without *P. weirii* or Douglas-fir weakened by *P. weirii*. Black stain root disease was observed in one group of 30-inch DBH Douglas-firs.

Many of the trees in both sections of the planning area were damaged severely by fire in 1951. Large wounds, as high as 40 feet up the bole, were observed on the uphill side of each tree. Considerable decay was observed and detected by increment boring in scarred individuals. The major type of decay was brown crumbly rot caused by *Fomitopsis pinicola*. Several wounded trees broke off at points of severe decay, especially trees at the edge of openings. Loss through cull will continue, and very little radial tree growth is occurring.

Evidence of Douglas-fir beetle (*Dendroctonus pseduotsugae*) was found in many of the windthrown and root-diseased Douglas-firs. This pest currently is not attacking green standing trees. However, if future windthrow continues at a rate greater than four trees per acre per year, widespread mortality in Douglas-fir could result from buildup of Douglas-fir beetle.

RECOMMENDATIONS

The following implications of management alternatives should be considered when formulating silvicultural prescriptions for the Enola Planning Area:

1. Do nothing -- Tree growth loss, cull, mortality, and windthrow will continue to increase in the stand, mainly due to laminated root rot. Infection will spread into uninfected areas at a rate of 1 to 2 feet per year. Healthy-appearing firs in infected areas will eventually either be windthrown or die standing.

2. Patchcuts -- Small clearcuts could capture salvageable volume in root diseased and heartrotted trees before additional volumes are lost to decay. Planting these areas with alder, cedar, white pine, or hemlock - in that order of decreasing resistance to root rot - would reduce future losses from *P. weirii*. Fir that becomes established naturally within the cutting units should be discriminated against when thinning. Cutting units would have to be designed to meet visual objectives and reduce windthrow, otherwise large amounts of windthrow could result in buildup and damage caused by Douglas-fir beetle.

3. Clearcut -- Total removal of all merchantable trees and destruction of all unmerchantable trees with several fairly large clearcuts will capture all volume that will be lost in the future to *P. weirii*. If alder, hemlock, or cedar are planted, damage due to laminated root rot will be reduced to an insignificant level. However, this is a very disruptive alternative and due to visual, watershed and wilderness proximity restrictions, this alternative is probably not a viable one.

4. Stump treatment -- Stump treatment by either total excavation of infected stumps or fumigation with volatile chemicals will eliminate most of the fungal inoculum that would serve to infect the future stand. Any species could then be regenerated on the site. Stump removal is restricted by terrain and would not be feasible in Enola. Stump fumigation is still highly experimental.

Patchcutting is probably the most viable option if timber is to be harvested and visual as well as other objectives met. The main challenge will be to arrange cutting units in such a way as to capture as much of the potential mortality as possible in and around root disease centers and, at the same time, minimize blowdown at unit boundaries. Root rots are the most important factor predisposing Douglas-fir to windthrow according to Gratkowski (1956). He presents guidelines for reduction of windthrow, two of which will be difficult to meet in the Enola Planning Area:

1. "Do not expose cutting boundaries in which either *Polyporus schweinitzii* Fr. or *Poria weirii* Murr. are abundant. Such stands are highly susceptible to windthrow and should be removed during the early cutting cycles."

and

2. "Trees along the cutting line that show signs of root rot, butt rot, or extensive trunk rot should be marked for removal while the unit is being logged."

Forest Pest Management pathologists would be available to assist in on-the-ground marking of unit boundaries to avoid leaving trees with root, butt, or trunk decay.

The information and recommendations presented in this report have been specifically formulated for the Enola Area. Although some of this information may be applied to other areas in Oregon and Washington experiencing similar pest problems, these areas may be sufficiently different from the area we surveyed to warrant a separate biological evaluation to formulate management alternatives specific to that area. Forest Pest Management pathologists and entomologists encourage and are available to perform such evaluations at the request of land managers.

REFERENCES

Gratkowski, H. J. 1956. Windthrow around staggered settings in old-growth Douglas-fir. For. Sci. 2:60-73.

Hadfield, J.S. and D. W. Johnson. 1977. Laminated root rot: a guide for reducing and preventing losses in Oregon and Washington forests. Forest Pest Management, Pacific Northwest Region, USDA Forest Service, Portland, OR. 16 p.

Wallis, G. W. and W. J. Bloomberg. 1981. Estimating the total extent of *Phellinus weirii* root rot centers using above - and below-ground disease indicators. Can. J. For. Res. 11:827-830.

Prepared by: Gregory M. Filip — 3-23-84

Gregory M. Filip, Plant Pathologist — Date

Prepared by: _____ _____

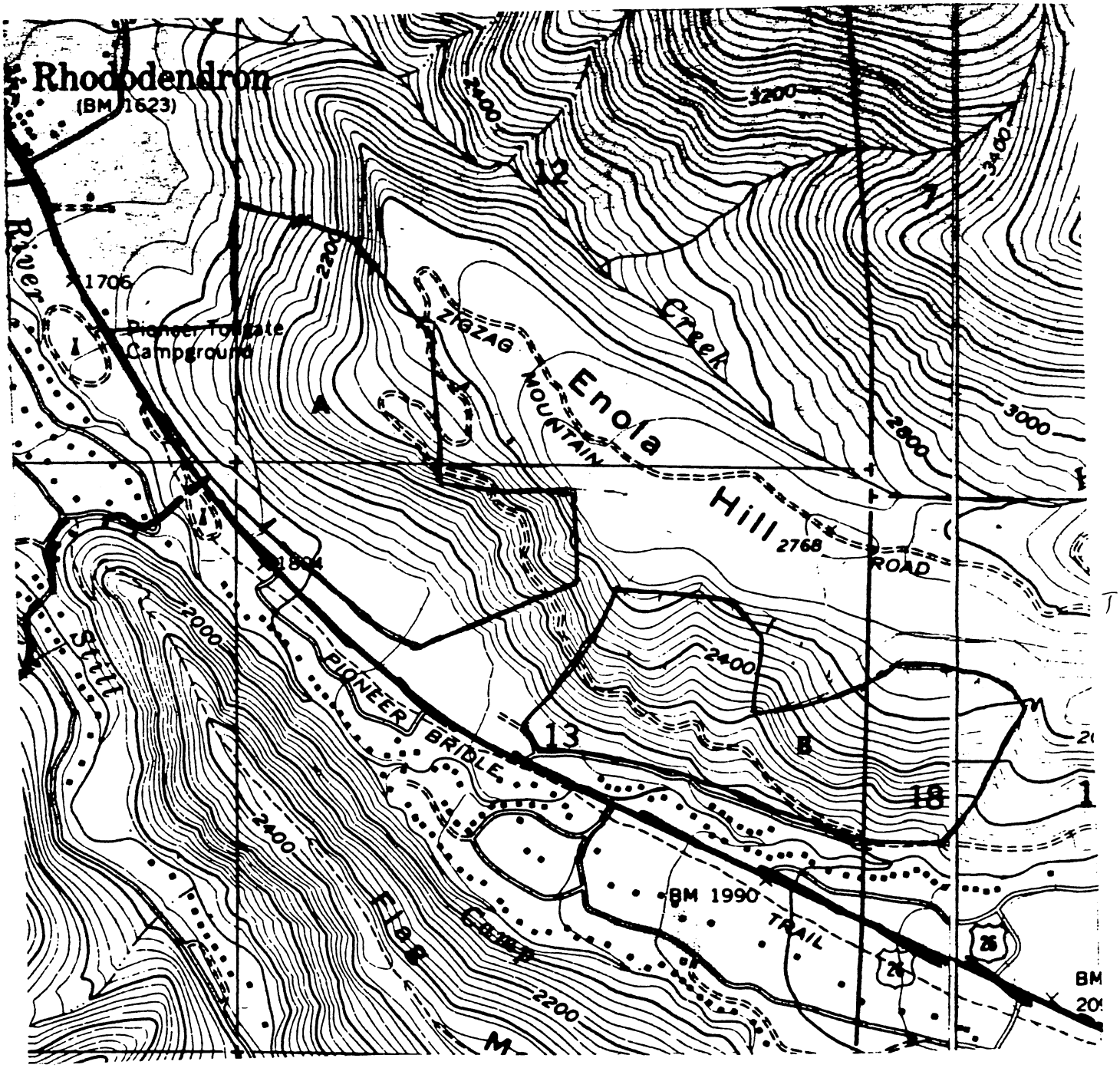
Craig L. Schmitt, Plant Pathologist — Date

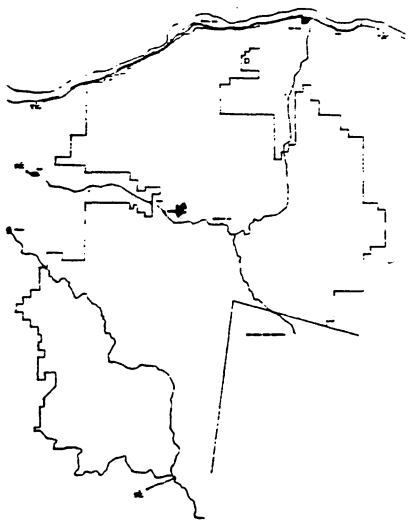
Reviewed by: James S. Hadfield — 3/26/84

James S. Hadfield, Supervisory Pathologist — Date

Approved by: Paul E. Buffam — 4/4/84

Paul E. Buffam, Director, Forest Pest Mgmt. — Date





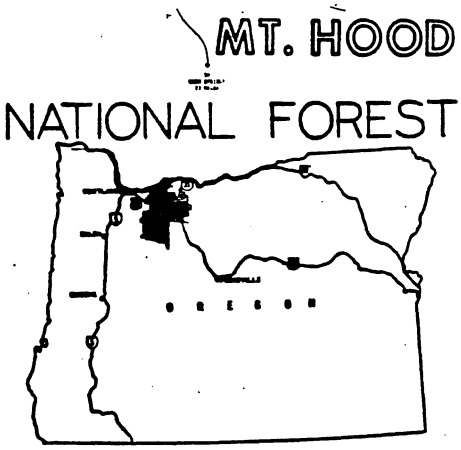


Fig. 1--Map showing location of the Enola Planning Area Sections A and B.

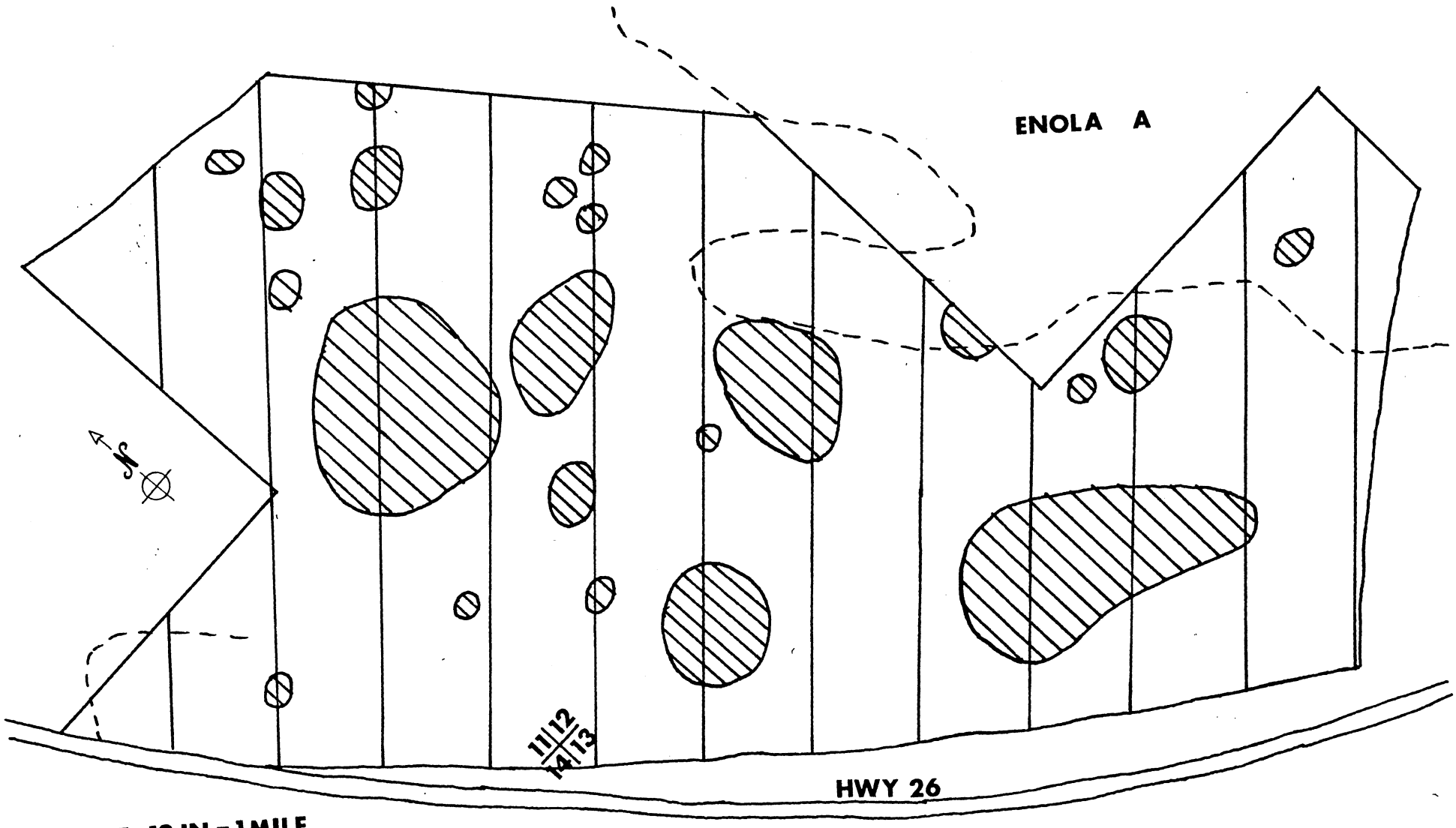


Fig. 2--Map showing location of transects and root disease centers in Enola A.

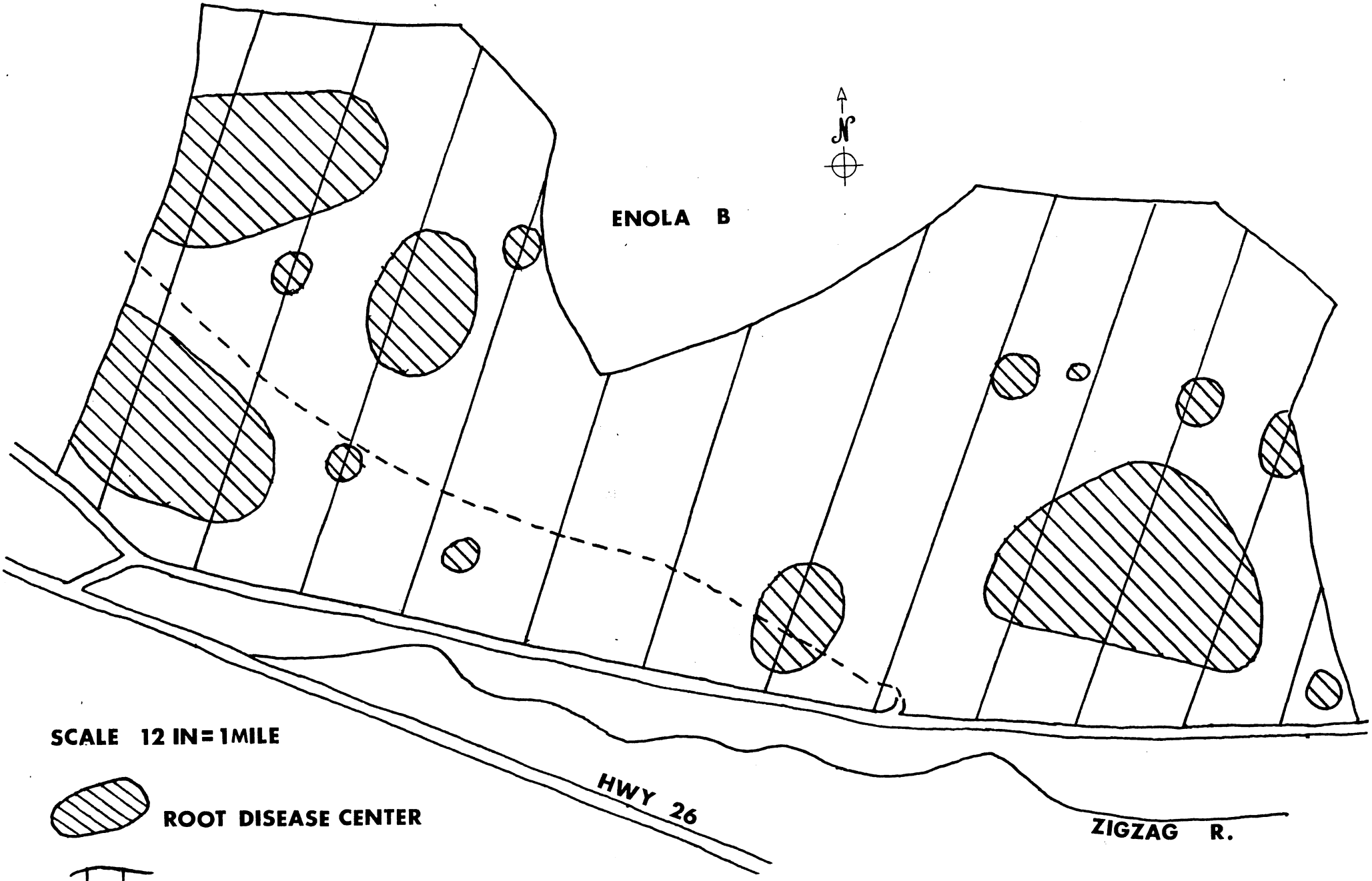


Fig. 3--Map showing location of transects and root disease centers in Enola B.